

Pushing the Envelope

Airplane Characteristics

Work Needs

- **Low cycle time, design, manufacture, certification to meet highly competitive market**
- **Structures and propulsion that permit low total operating costs for large aircraft and supersonic aircraft**
- **Technologies to reduce accident rate by order of magnitude from all causes**
- **Supersonic flight anywhere**
- **VSTOL with 0.75M(V), 500 mile range, cost competitive, environmentally friendly**
- **Airplane that operates around the clock with low noise and pollution**

World Opportunities

- **Unmanned airplanes**
- **Highly survivable aircraft**
- **Reconfigurable aircraft**

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Infrastructure Characteristics

World Needs:

- **Technologies that increase (two to four fold) the throughput of passengers, cargo and airplanes**
- **More, quieter airports (many small capacity or relatively fewer but larger ones); V ports**
- **Minimize the time and cost for modal change**
- **24 hour adverse weather capable airports**

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Air Traffic Management

World Needs:

- **ATM that is high capacity (can handle two to four fold increase), cost effective, efficient and safer**
- **A global system that enables optimum operation of a wide variety of aircraft**
- **Improved situational awareness in cockpit (aircraft, weather, traffic, etc.)**

Technologies

- **Improved weather information and modelling capabilities, delivered to the cockpit**
- **Automated air traffic system, from block-to-block**

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Vision

In our world, there is general affluence and a burgeoning middle class which will bring about an unprecedented worldwide demand for cost-effective air transportation.

The consumer is the king.

The result is a multi-modal need for :

- **Totally integrated transportation system**
- **More aircraft**
- **Faster aircraft (subsonic or supersonic)**
- **Cargo aircraft**
- **VTOL aircraft**
- **Supporting infrastructure and systems**
- **Revolutionized, high capacity, air traffic control system**
- **Mass customized and premium services**
- **Cheaper access to space**
- **Improved safety, security and environment**

The consumer will cause these products and services to be created/provided. If the U.S. is unwilling or unable to provide the necessary research or leadership, the market will demand someone else does. Ultimately, the worldwide consumer will be satisfied.

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Access to Space

World Needs/Opportunities:

- **Improved reliability, for overland launch**
- **Combined cycle air augmented/breathing propulsion**
- **Low cost launch & ground support**
- **Launch on demand with reduced weather constraints**
- **Reduce on-orbit debris**
- **Low cost recovery of forced reentry of LEO satellites**

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Limited U.S. Military Global Responsibilities

World Needs/Opportunities:

- **Commercial aircraft compatible with military requirements, with minimum penalties**
- **Unmanned robotic and autonomous aircraft with military roles, beyond surveillance, reconnaissance and C₃**
- **Common commercial/military service life on products**
- **High reliability, high survivability weapons systems**

Conclusion

Having become thoroughly immersed in our “world” and having viewed the other worlds, we vigorously support the three goals for U.S.

Aeronautics:

- **Maintain the superiority of aero products and services**
- **Improve safety, efficiency and cost**
- **Ensure the long-term environmental compatibility**

We are extremely concerned that the U.S. may be unwilling or unable to provide the basic research, systems, approach, leadership and necessary national alliances to achieve these goals.

Aeronautics leadership and the attendant technology and highly compensated jobs could quickly move from the U.S. to other areas of the world. Trade balances would be adversely affected, national security compromised, and control of our transportation system, which is integral to our economy, lost.

We strongly recommend that NASA:

- **Be responsible for high risk/high payoff research**
- **Provide leadership for and/or vigorously support aerospace/transportation alliances (FAA, DOT, DOD, Academia, manufacturers, airlines)**
- **Create interactive forums to interchange user needs, research agendas and priorities**
- **Ensure research is matured to acceptable risks before it is transferred**

Much of the technology that air transportation needs have been identified already in other studies. What is missing is the leadership, prioritization and integration.